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COUNTRY USSR

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SUBJECT Comments and Evaluations of Article on Hot Forging

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New Developments in the Technology of Hot Forging - Ye P Unksov: Mashgiz (1948) 222 pp

1. On the whole, a conventional book on forging with particular reference to new developments, from perhaps 1938 on.

Chapter I (39 pp)	various types of hammers and presses
Chapter II (12 pp)	auxiliary equipment, such as cleaning facilities, manipulators, conveyors
Chapter III (17 pp)	furnaces and heating equipment
Chapter IV (74 pp)	forging practice
Chapter V (58 pp)	determination of needed forge or press capacity
Chapter VI (15 pp)	dies
Bibliography	

2. Today none of the "new developments" seems very startling, and probably didn't even in 1948. The most similar USA book is perhaps Naujoks and Fabel, which was published before World War II. There are certain differences, however, apart from length.

(a) Some of the subjects discussed by Naujoks and Fabel but not by Unksov are: history, heat treatment of forgings, testing and inspection of forgings, forging materials.
(b) Naujoks and Fabel, on the other hand, have nothing comparable to the highly theoretical and mathematical subject matter of Chapter V of Unksov.
(c) As might be expected from publication dates, Unksov gives many more military examples than Naujoks and Fabel.

W Naujoks and D C Fabel: Forging Handbook. ASM (1939) 630 pp

3. It would seem that the book was written for two entirely different types of readers. The practical information (all chapters except V) would certainly appeal to plant engineers and to skilled workmen concerned with any phase of the forging industry. Chapter V seems to be suitable only for highly trained

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engineers, physicists and mathematicians. The title of Chapter V sounds very down-to-earth: Determination of the Size Equipment Necessary for Carrying Out Given Technological Operations. Actually Unksov dismisses the empirical method immediately and devotes this chapter to a discussion of the considerable theoretical and experimental work done in this field in the past few years. Although Unksov admits the discrepancies between theory and practice, he feels the theoretical and experimental aspects cannot be ignored and may eventually lead to an accurate scientific method that will displace the present approximate empirical determination.

4. Thirteen of the 34 references are to non-Soviet magazines or recognizably non-Soviet authors. Non-Soviet authors are also cited by name in the text.

5. Unksov states that 15 to 20% of all metal melted in the USSR is eventually forged. Exactly comparable figures are not available for the USA; but, on the basis of steel production and the Bureau of Census data on forgings, approximately the same order of magnitude would appear to apply here, for steel at any rate.

6. The largest press mentioned by Unksov is a 10,000 (metric) ton unit, about which he says merely that "it is known that at the present time work is under way on the construction of mechanical presses with a capacity of 10,000 tons". Nothing is said about the 33,000-ton press that has been widely reported in the USA technical press to have been "liberated" by the Soviets in Germany. Nor is any mention made of units of the sizes included in the US Air Force heavy-press program, which at one time covered various sizes from 20,000-ton extrusion presses to forging presses with capacities from 25,000 to 50,000 tons.

Engaged in translation and comments on foreign technical articles of interest

7. Scale-free furnaces were not widely used at the time the book was written. Induction heating set-ups are mentioned, but salt baths and resistance heating, which have found a limited use here, are not. Unksov expects there will be a much more extensive use of protective atmospheres, electrical heating and induction heating in the future, not only to give a better product and to prolong die life, but also to avoid the approximately 4 to 6% of raw material lost as scale.

8. One rather surprising item is the mention in two places of automobile differential gears, where no machining is done on the teeth after forging. It is rather questionable whether the accuracy of such gears would meet USA requirements but apparently they are considered adequate in the USSR.

9. In general the materials and processing are comparable to those used in the USA for equivalent purposes, although a much greater variety of grades is found in the USA. As a matter of fact, a number of the die-block compositions appear to have been copied from USA grades. For example, the chromium-molybdenum-nickel steel mentioned on p 217 is identical with Finkl's Durodi.

(a) One noticeable difference, which is perhaps the result of a typographical error although it is not mentioned on the errata sheet, is the 1.10% P shown on p 8 for cylinder sleeves of alloy cast iron. In this country, 0.10% P would be more probable for this application and composition.

(b) The 7 Kh 3 mentioned on p 212 is a straight chromium steel with about 0.60/0.75% C and 3.2/3.8% Cr. In the USA similar types of steels used for hot work applications have generally contained molybdenum (perhaps 0.7%) and sometimes vanadium (about 0.5%) as well.

(c) There are few signs of alloy shortages in this field; presumably it was considered important enough that fairly high alloy contents were permitted even during the war. A 5 KhGM was introduced, however, with manganese as a replacement for nickel in die blocks.

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In the USA a steel of this type was not used, even when nickel was short; but in Germany a lower carbon lower chromium steel of this general type (40 CrMnMo 7) was used during World War II and has been retained today. Also mention is made by Unksov that some of the forging machines were supplied with heat-treated carbon-steel shafts, which have since been replaced with alloy steel.

(d) Cast-steel and cast-iron die blocks and hot-forming dies have found some use in the USA and elsewhere but seem to have been little used, if at all, in the USSR.

(e) No mention is made of the widely used chromium-base die steels with about 0.35% C, 5% Cr, 1.5% Mo and, in some cases, tungsten and vanadium. As a rule these steels have been found to be far superior to the lower chromium and tungsten-base steels mentioned by Unksov, and are extensively used in the USA for press and forging dies.

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